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MATSUBARICHTHYS INUSITATUS, A NEW GENUS AND SPECIES OF VELVETFISH (SCORPAENIFORMES: APLOACTINIDAE) FROM THE GREAT BARRIER REEF

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Abstract.—*Matsubarichthys inusitatus* is described from a single specimen, taken from One Tree Island, Queensland, Australia. It is readily distinguished from other scorpaenoids by its unique dorsal-fin formula (II, IV, 6) and vertebral formula (9 + 12 = 21), both with fewer elements than previously reported for a scorpaenoid; a low anal fin-ray count (II,4); a pelvic fin-ray count of I,1; and the gill opening restricted to a pore dorsal to the opercle. Although the holotype is small (8.5 mm SL) and study of its internal anatomy thus limited, *Matsubarichthys inusitatus* is a relatively primitive aploactinid that can not be readily assigned to either of the two currently recognized aploactinid subfamilies, but may be a sister-group of the Bathyaploactininae.

Neuston tow sampling conducted at One Tree Island at the southern end of the Great Barrier Reef resulted in the capture of a single predemersal-staged specimen representing a new genus and species of Aploactinidae (velvetfishes).

Aploactinids, of which 36 have been previously described, are widely distributed throughout the Indo-Pacific. However, many remain extremely rare in collections and thus poorly understood. Although it is evident that velvetfishes are closely allied with the scorpionfishes, particularly the stonefishes and waspfishes (Matsubara, 1943a), the combination of presumptively uniquely derived characters used to define the family presents conflicting hypotheses of relationship. This paper describes an aploactinid scorpaenoid whose features underscore this conflict.

Materials and methods.—Counts and head spine terminology used in this paper follow those of Eschmeyer (1969). Measurements were taken as specified in Poss (1982), but using an ocular micrometer instead of dial calipers. Illustration of the axial skeleton was based on multiple radiographs using Olympus SZH and Leitz Stereo TS binocular dissecting microscopes.

Radiographic techniques suggested by Tucker and Laroche (1984) were followed. Radiographs were taken on a Koizumi Softex SE X-ray unit, using Kodak ultrafine grain SB single emulsion diagnostic radiographic film and Kodak Industrex R type film. Exposure times of 6 to 12 sec at 50 to 70 kv and 3 mA were employed.

The specimen was lightly stained with alizarin red S in 70% ethanol to show more clearly critical osteological features not visible in the radiographs. The bones stained only weakly, probably the result of prolonged storage in unbuffered formalin prior to transfer to ethanol.

The abbreviation AMS designates the Australian Museum, Sydney, where the holotype and only specimen is deposited.

Matsubarichthys, new genus
Figs. 1, 2

Type species.—*Matsubarichthys inusitatus.*

Diagnosis.—An aploactinid scorpaenoid fish with: dorsal fin II, IV, 6; anal fin II, 4;

pelvic fin I, 1; 15 pectoral fin-rays; fin rays in all fins unbranched; no enlarged preorbital spines; no scales (except for lateral line); branchiostegal membranes connected to isthmus along entire length, opening to opercular chamber restricted to a small pore above tip of opercle; no slit behind posteriormost hemibranch; no pterygiophore inserting between neural spines of sixth and seventh vertebrae.

Matsubarichthys inusitatus can be distinguished readily from all other scorpaenoid fishes by its dorsal-fin, pelvic-fin, and vertebral counts, which are lower than those of any other species in the suborder.

Description.—Head large (Fig. 1), without extensive spination. Lacrimal (infraorbital 1), immovable, its posteroventral border with 2 small, weak spines. Infraorbital bones 2 and 3 strongly arched, with large infraorbital canal pores opening as distinctly raised tubes. Small, tubular, fourth infraorbital bone present. Nasal bone tubular, without spine. Anterior nostril, an attenuate tube near tip of snout, extends over premaxilla. Interorbit wide, with ascending processes of premaxillae extending between anterior half of orbits. Mouth strongly upturned. Teeth on upper and lower jaws; none on palatines. Presence of teeth on vomer uncertain. No slit behind posteriormost hemibranch. One infrapharyngobranchial tooth plate. Epibranchial of first gill arch with a narrow, notably short uncinate process extending posteromedially from dorsal ramus of bone at an angle of about 90°. Three lateral-line pores on each side on lower jaw, a fourth between lower jaw and preopercle on each side. Interhyal narrow throughout its length, not expanded posteriorly. Branchiostegal rays 6. Posterior opening of opercular chamber restricted to a small pore above tip of opercle, with branchiostegal membranes firmly attached to isthmus. Ventral surface of urohyal narrow. No pseudobranch.

Body covered with smooth skin, naked, except for lateral line. Swimbladder not visible in radiograph, probably absent. First two dorsal-fin pterygiophores enlarged and closely associated with cranium, both inserting in first interneural space; first dorsal spine in supernumerary and second in serial association with first pterygiophore, both spines enlarged and robust, the second notably so; third pterygiophore inserting in fourth interneural space and bearing no supernumerary spine (Fig. 2). Neural spines of first two vertebrae small, directed forward, but not clearly visible in radiographs. Neural spines of sixth and seventh vertebrae without interdigitating dorsal-fin pterygiophore. Caudal skeleton with parhypural and hypurals 1, 2, 3, and 4 fused into single plate and to urostyle (hypural 5 not visible in radiograph); neural spine of preural centrum wide and long; number of epurals and uroneurals not determinable.

Etymology.—Named in honor of the late Professor Kiyomatsu Matsubara, in recognition of his pioneering and inspiring research on scorpaenoid fishes. The gender is masculine.

Matsubarichthys inusitatus,
new species
Figs. 1, 2

Holotype.—AMS I.29395-001, 8.5 mm standard length (SL). Australia, Queensland, Great Barrier Reef, Capricorn Group, One Tree Island, 23°30′S, 152°05′E, neuston tow, Patti D. Schmitt, date, time, and depth of capture unknown.

Description.—Dorsal fin-rays II, IV, 6. Anal fin-rays II, 4. Pectoral fin-rays 15 right, 15 left. Caudal fin damaged, but relatively long and rounded, without branched rays; 10 segmented rays (5 ventral; 5 dorsal), and 4 unsegmented, procurrent rays (2 dorsal; 2 ventral). Lateral line with 6 long, tube-like scales, the first 3 very close together, the last extending over base of caudal fin. Gill rakers 1 + 4 = 5 (right). Vertebrae: 9 precaudal + 12 caudal = 21.

Head extremely large; notably depressed

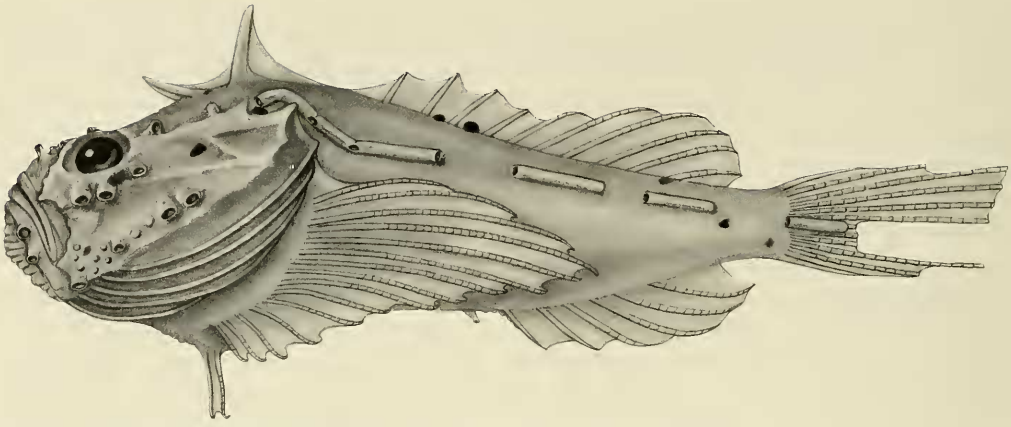

Fig. 1. Holotype of *Matsubarichthys inusitatus* in lateral view (AMS I.29335-001, 8.5 mm SL). Broken tip of second dorsal fin spine reconstructed.

(specimen with buccal cavity strongly flared laterally on preservation). Lacrimal with small spinous points, but without enlarged spines or strong ventral lobes. Preopercle with 2 short, somewhat blunt spines near posterior margin of third infraorbital bone, the more dorsal the larger; additional, more ventrally located spines, if present, not visible through skin. Cheek with a few fleshy protuberances. Similar warty structures scattered over ventral surface of head.

Body scales absent, except for lateral line. Lateral-line scales extremely long, distinctly tubular. The first 3 touch each other and appear, without high magnification, as a single elongate scale, except for presence of pores demarking their ends.

Dorsal fin originates above dorsal arm of preopercle, with anteriormost two spines well separated from remainder of fin; the first locked and directed anteriorly, the second more robust, also locked, but directed vertically. Second spine broken (reconstructed in Fig. 1). Third and succeeding spines relatively narrow.

Color in life unknown. Color of specimen, now in 70% ethanol, uniformly buff tan with several conspicuous, densely melanic inclusions that form distinct, deep-to-superficial spots, most bilaterally symmetric: largest, about ¼ to ⅓ size of pupil in ventral well of orbit just dorsal to third infraorbital bone; another smaller spot deep and immediately ventral to opercular-hyomandibular hinge; a smaller inclusion just dorsal to opercular opening, and a still smaller spot anterior to this; two small spots on each side posterior to symphysis of premaxillae; large spot on left side of isthmus; several minute dark spots over ventral surface of iris, one lateral to urostyle. Small, densely melanic spots at bases of dorsal-fin spines, one between base of first and second, one posterior to fourth, and a more conspicuous one posterior to fifth spine; spot anterior to anal-fin origin; another near base of last dorsal-fin ray (right side only); one in axil of left (but not right) pectoral fin.

Measurements for the holotype in mm are as follows (percent SL in parentheses): standard length 8.5, head length 3.7 (44); snout 0.8 (9); orbit 1.0 (12); interorbit 1.0 (12); jaw 1.4 (16); postorbit 2.0 (24); body depth 3.1 (36); predorsal 2.2 (26); anal fin 2.9 (34); caudal fin 1.6 (19); pectoral fin 3.1 (36); pelvic fin 0.6 (7); dorsal spines, first 0.7 (8), second 0.9 (11), third 0.3 (4), fourth 0.6 (7), fifth 0.7 (8), sixth 0.7 (8); anal spines, first 0.8 (9), second 1.1 (13); width of interorbital ridge 0.4 (5); caudal peduncle depth 0.9 (11); snout to second dorsal spine 2.3 (27), to third dorsal spine 4.0 (47), to fourth dorsal

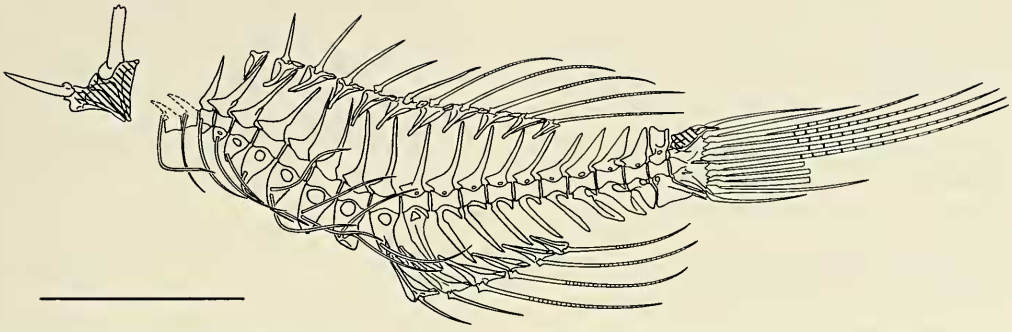

Fig. 2. Axial skeleton of holotype of *Matsubarichthys inusitatus* as reconstructed from multiple radiographs. Neural and haemal spines are not autogenous. Shape of anterior pterygiophores and epural region of caudal skeleton (indicated by hatching) cannot be determined from radiographs. Bar represents 2.0 mm.

spine 4.4 (52), to fifth dorsal spine 4.7 (55), to pelvic-fin insertion 3.0 (35); width of first dorsal spine at midlength 0.2 (2); depth of interorbit at midorbit 0.1 (1); incision of fin membrane at fourth dorsal spine from tip to membrane 0.1 (1); opercular tip to dorsal fin 0.7 (8); uppermost preopercular spine 1.0 (12); first dorsal spine to fifth dorsal spine 3.1 (36), to pelvic-fin insertion 2.8 (33), to anal-fin origin 4.5 (53); fifth dorsal spine to pelvic-fin insertion 4.0 (47), to last dorsal spine 0.9 (11), to anal origin 2.2 (26); last dorsal spine to last dorsal ray 2.3 (27), to pelvic insertion 4.0 (47), to last anal ray 2.4 (28), to anal origin 2.0 (24); last dorsal ray to last anal ray 1.2 (14), to anal origin 2.4 (28); anal-fin origin to last anal ray 1.9 (22); pelvic-fin insertion to anal-fin origin 3.2 (38).

Distribution.—Known only from the holotype taken near the southern end of the Great Barrier Reef at One Tree Island, Capricorn Group, Queensland, Australia.

Etymology.—The Latin specific epithet, *inusitatus,* means unusual or rare.

Comparisons.—A pelvic fin with only one spine and a single soft ray (I,1) is known to occur among scorpaenoids only in atypical specimens of the aploactinids *Erisphex pottii* and *Kanekonia florida.*

Distinct, densely melanic spots on the head are unusual among scorpaenoids. It is likely that their presence in our specimen is a transitory larval/juvenile character but this cannot be verified until larger specimens are collected. Large tubular lateral-line scales occur commonly in *Cocotropus*-stem scorpaenoids. Those of *Matsubarichthys inusitatus* are particularly large, but this exaggerated size may reflect a juvenile condition. In the tetrarogine *Coccotropsis gymnoderma,* which also has very large tubular lateral-line scales, those of very small specimens appear disproportionately large. Conspicuous cephalic lateral-line pores are present in the aploactinid *Prosoproctus pataecus* (see Poss & Eschmeyer, 1979). Distinctly tubed head pores occur in a number of aploactinids, for example *Xenaploactis anopta* (see Poss & Eschmeyer, 1980).

Discussion.—The precise limits of the Aploactinidae and the details of their phylogeny are uncertain due to the high degree of morphological differentiation and considerable character incompatibility among specialized features otherwise useful in characterizing velvetfishes. Matsubara (1943a, 1943b) defined the aploactinids (as a subfamily Aploactinae [sic] of the Scorpaenidae) based on the close association of the anteriormost two dorsal spines with the cranium, their separation from succeeding dorsal spines, a highly reduced suspensorium, and lack of a supraoccipital crest (neither of the latter two features readily visible from radiographs of *Matsubarichthys inusitatus*). These features probably are not

uniquely derived among scorpaenoids and do not characterize all aploactinids. Among scorpaenoids it is typical for a single pterygiophore to insert between each successive pair of neural spines, except the anteriormost. However, among all species assigned to the Aploactinidae as delimited by Poss & Eschmeyer (1978), a single pair of neural spines, invariably of vertebrae 6–8, have no interdigitating pterygiophore.

A combination of presumably specialized, but not uniquely derived, features readily distinguishes aploactinids from other scorpaenoid fishes. These include the total absence of branched fin rays, notably tubular and often highly ornamented lateral-line scales, non-spinous, tubular nostrils, pelvic fins with 1–3 soft rays, no slit behind the 4th gill arch, a single infrapharyngobranchial tooth plate, no palatine teeth, typically blunt as opposed to pungent head spines, and atypical, tack-like, pseudocycloid or ctenoid scales, when scales are present. These features also place *Matsubarichthys inusitatus* within the Aploactinidae.

Matsubarichthys inusitatus can not, however, be assigned unequivocally to either aploactinid subfamily. *Matsubarichthys inusitatus* is unlike members of the Aploactininae in lacking a unique papillose extension near the isthmus that forms a seal between the otherwise separate isthmus and branchiostegal membranes (Poss & Eschmeyer 1978). Although *M. inusitatus* shares a highly restricted gill slit and a narrow posterior margin of the interhyal with members of the Bathyaploactininae, it lacks the greatly enlarged and highly movable first infraorbital bone, rather spatulate head spines, and characteristic orientation, shape, and reduced size of the opercle that characterize the two bathyaploactine genera *Acanthosphex* and *Bathyaploactis.* Interestingly, the first epibranchial of *Matsubarichthys inusitatus* bears a much reduced posteromedially directed uncinate process similiar to that of *Acanthosphex leurynnis* and *Kanekonia florida. Matsubarichthys* may prove to be the sister-group of the bathyaploactines. If so, the shapes of the highly mobile, complex, and variously spined lacrimals seen in both aploactinines and bathyaploactines, and especially useful in diagnosing the genera, may be quite plastic phylogenetically.

As Poss & Eschmeyer (1979) pointed out, it is difficult to argue that the presence of restricted gill slits resulting from fusion of the branchiostegal membranes to the isthmus is uniquely derived among scorpaenoids (these authors erroneously included *Gnathanacanthus goetzeei* among scorpaenoid species with restricted gill openings). Nonetheless, the combination of features associated with this fusion that occurs in all members of the Synanceiinae (sensu Eschmeyer & Rama Rao 1973 and including Erosinae of Matsubara 1943a, 1943b), the Minoinae, the Choridactylinae (sensu Eschmeyer et al. 1979), and some aploactinid scorpaenoids, may indicate common ancestry. Many species of these lineages possess extremely large heads (greater than 40% SL), enlarged and variously mobile lacrimal spines, anterior neural spines in the region of precaudal vertebrae 5 to 8 that are notably thinner and more delicate than the others, a long and expanded neural spine on the first preural centrum, a strongly consolidated caudal skeleton with a reduced number of caudal fin-rays, palatines without teeth, a single bilaterally symmetric pair of infrapharyngobranchial tooth plates (except *Inimicus* spp. and *Erosa erosa,* which have two bilaterally symmetric pairs, albeit the anterior pair substantially reduced in the latter genus), and loose, virtually naked skin (lateral-line scales and vestigial scales in a few species excepted).

Like other aploactinids, *M. inusitatus* is more specialized than the synanceiines, choridactylines, and minoines, at least in having one pair of consecutive neural spines (6 and 7 in *M. inusitatus*) of the precaudal vertebrae that lacks an intervening dorsal pterygiophore. Like some aploactinids, the

anterior nostril is far forward on the snout. The combination of character states in *M. inusitatus* results in incompatibility among shared, derived characters that would otherwise be useful in establishing the cladistic relationships of the relatively advanced members of the *Cocotropus* stem. Another rare scorpaenoid, *Eschmeyer nexus,* which exhibits a number of features discussed above (Poss & Springer 1983), poses similar problems. Additional specimens of *Matsubarichthys inusitatus* and other extremely rare basal aploactinids are needed for more rigorous analyses.

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